



SEQUENCE LISTING

RECEIVED
OCT 27 2000
TECH CENTER 1600/2200

<110> Panaccio, Michael
Hasse, Detlef

<120> THERAPEUTIC AND DIAGNOSTIC COMPOSITIONS

<130> DAVIE60.001APC

<140> 09/077574

<141> 1998-09-24

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<212> DNA

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Ser Arg Gly Val Asp Lys Leu Ala Asn Ala Val Lys Val Thr Leu Gly	
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cct aaa ggc cgt aat gtc gtt att gaa aag tct ttt ggt tcc cca gtt	144
Pro Lys Gly Arg Asn Val Val Ile Glu Lys Ser Phe Gly Ser Pro Val	
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att aca aaa gat ggt gta tct gtt gca aaa gaa att gaa ctt gaa gat	192
Ile Thr Lys Asp Gly Val Ser Val Ala Lys Glu Ile Glu Leu Glu Asp	
50 55 60	
aag ttt gaa aat atg ggc gct caa atg gtt aaa gaa gta gct ccc aaa	240
Lys Phe Glu Asn Met Gly Ala Gln Met Val Lys Glu Val Ala Pro Lys	
65 70 75 80	
act agc gat att gct ggt gat gga act aca aca gca aca gtc ctt gca	288
Thr Ser Asp Ile Ala Gly Asp Gly Thr Thr Thr Ala Thr Val Leu Ala	
85 90 95	
caa gct att tat cgt gaa ggt gta aaa ctt gta gca gct ggt cgt aat	336
Gln Ala Ile Tyr Arg Glu Gly Val Lys Leu Val Ala Ala Gly Arg Asn	
100 105 110	
cct atg gcc att aaa cgt ggc ata gat aaa gct gtt gtt gct gtt act	384

Pro Met Ala Ile Lys Arg Gly Ile Asp Lys Ala Val Val Ala Val Thr	
115 120 125	
aaa gaa cta agc gac att aca aag cct act cgt gac caa aaa gaa ata	432
Lys Glu Leu Ser Asp Ile Thr Lys Pro Thr Arg Asp Gln Lys Glu Ile	
130 135 140	
gct caa gtt gga acc att tot gca aac tct gat aca aca ata ggt aat	480
Ala Gln Val Gly Thr Ile Ser Ala Asn Ser Asp Thr Thr Ile Gly Asn	
145 150 155 160	
atc ata gct gaa gct atg gct aaa gtt gga aaa gga ggt gtt atc aca	528
Ile Ile Ala Glu Ala Met Ala Lys Val Gly Lys Gly Gly Val Ile Thr	
165 170 175	
gtt gag gaa gct aaa ggt ctt gaa act aca tta gat gtg gtt gaa gga	576
Val Glu Glu Ala Lys Gly Leu Glu Thr Thr Leu Asp Val Val Glu Gly	
180 185 190	
atg aag ttt gac cgt ggc tac ctc tct cca tac ttt gta act aat cct	624
Met Lys Phe Asp Arg Gly Tyr Leu Ser Pro Tyr Phe Val Thr Asn Pro	
195 200 205	
gag aaa atg gtt tgt gaa ctt gat aac cct tat atc ctt tgt aat gag	672
Glu Lys Met Val Cys Glu Leu Asp Asn Pro Tyr Ile Leu Cys Asn Glu	
210 215 220	
aaa aag att act agc atg aaa gac atg cta cca atc tta gaa caa gtt	720
Lys Lys Ile Thr Ser Met Lys Asp Met Leu Pro Ile Leu Glu Gln Val	
225 230 235 240	
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Ala Lys Val Asn Arg Pro Leu Leu Ile Ile Ala Glu Asp Val Glu Gly	
245 250 255	
gaa gca ctt gca aca ctt gta gtc aat aag ctc cgt gga gca ctc caa	816
Glu Ala Leu Ala Thr Leu Val Val Asn Lys Leu Arg Gly Ala Leu Gln	
260 265 270	
gtt gta gcc gta aaa gct cct ggt ttt ggt gaa cgc cgt aaa gct atg	864
Val Val Ala Val Lys Ala Pro Gly Phe Gly Glu Arg Arg Lys Ala Met	
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ctt gaa gat att gct atc ctt act gga gga gaa gca ata ttt gaa gat	912
Leu Glu Asp Ile Ala Ile Leu Thr Gly Gly Glu Ala Ile Phe Glu Asp	
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cgt ggt ata aag ctt gaa aat gta agc ttg tct tct tta gga aca gct	960
Arg Gly Ile Lys Leu Glu Asn Val Ser Leu Ser Ser Leu Gly Thr Ala	
305 310 315 320	
aaa cgt gta gtt att gac aaa gaa aat act act atc gtt gat ggt gct	1008
Lys Arg Val Val Ile Asp Lys Glu Asn Thr Thr Ile Val Asp Gly Ala	
325 330 335	
gga aaa tca gaa gat att aaa gct cga gtt aaa caa att cgt gca caa	1056
Gly Lys Ser Glu Asp Ile Lys Ala Arg Val Lys Gln Ile Arg Ala Gln	

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<212> PRT

<213> *Lawsonia intracellularis*

<400> 2

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Pro	Lys	Gly	Arg	Asn	Val	Val	Ile	Glu	Lys	Ser	Phe	Gly	Ser	Pro	Val
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Ile	Thr	Lys	Asp	Gly	Val	Ser	Val	Ala	Lys	Glu	Ile	Glu	Leu	Glu	Asp
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Lys	Phe	Glu	Asn	Met	Gly	Ala	Gln	Met	Val	Lys	Glu	Val	Ala	Pro	Lys
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Thr	Ser	Asp	Ile	Ala	Gly	Asp	Gly	Thr	Thr	Thr	Ala	Thr	Val	Leu	Ala
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Gln	Ala	Ile	Tyr	Arg	Glu	Gly	Val	Lys	Leu	Val	Ala	Ala	Gly	Arg	Asn
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Pro	Met	Ala	Ile	Lys	Arg	Gly	Ile	Asp	Lys	Ala	Val	Val	Ala	Val	Thr
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Val	Val	Ala	Val	Lys	Ala	Pro	Gly	Phe	Gly	Glu	Arg	Arg	Lys	Ala	Met
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Leu	Ala	Lys	Leu	Val	Gly	Gly	Val	Ala	Val	Ile	His	Val	Gly	Ala	Ala
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385					390					395					400
Asn	Ala	Thr	Arg	Ala	Ala	Val	Glu	Glu	Gly	Ile	Val	Pro	Gly	Gly	Gly
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Thr	Ala	Phe	Val	Arg	Ser	Ile	Lys	Val	Leu	Asp	Asp	Ile	Lys	Pro	Ala

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 Glu Pro Leu Arg Gln Ile Ala Ala Asn Ala Gly Tyr Glu Gly Ser Ile
 450 455 460
 Val Val Glu Lys Val Arg Glu Pro Lys Asp Gly Phe Gly Phe Asn Ala
 465 470 475 480
 Ala Ser Gly Glu Tyr Glu Asp Leu Ile Lys Ala Gly Val Ile Asp Pro
 485 490 495
 Lys Lys Val Thr Arg Ile Ala Leu Gln Asn Ala Ala Ser Val Ala Ser
 500 505 510
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 <213> *Lawsonia intracellularis*

<220>
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 tct gaa gaa aaa aca gct ggt gga ctc tat atc cct gat act gct aaa 96
 Ser Glu Glu Lys Thr Ala Gly Gly Leu Tyr Ile Pro Asp Thr Ala Lys
 20 25 30
 gaa aaa cca tct cgt ggt gaa gtt gtt gct gtt gga cct ggt aaa cat 144
 Glu Lys Pro Ser Arg Gly Glu Val Val Ala Val Gly Pro Gly Lys His
 35 40 45
 aca gat gat ggt aaa tta ata cct atg gct gta aaa gca gga gat aca 192
 Thr Asp Asp Gly Lys Leu Ile Pro Met Ala Val Lys Ala Gly Asp Thr
 50 55 60
 gtt ctt ttt aat aag tat gca gga aca gaa gta aag ctt gat ggt gta 240
 Val Leu Phe Asn Lys Tyr Ala Gly Thr Glu Val Lys Leu Asp Gly Val
 65 70 75 80
 gag cat cta gtt atg cgt gaa gat gac atc cta gct gtt att act gga 288
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 Glu Thr Gly Arg Lys
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<210> 4
 <211> 101
 <212> PRT
 <213> Lawsonia intracellularis

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 Glu Lys Pro Ser Arg Gly Glu Val Ala Val Gly Pro Gly Lys His
 35 40 45
 Thr Asp Asp Gly Lys Leu Ile Pro Met Ala Val Lys Ala Gly Asp Thr
 50 55 60
 Val Leu Phe Asn Lys Tyr Ala Gly Thr Glu Val Lys Leu Asp Gly Val
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 Glu His Leu Val Met Arg Glu Asp Asp Ile Leu Ala Val Ile Thr Gly
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 <212> DNA
 <213> Lawsonia intracellularis

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atgggttttt tgcttttaaa atagagatgt gtaggtaaca ttttttcctc catgaaatta 180
tttttttagga gatgttatca tgatgggg agt ttg ttt att gnt gcg aac agg 232
Ser Leu Phe Ile Xaa Ala Asn Arg
1 5

tat gaa aac cca tag nac agg gnt ggt act gtc tcc aat aat att gct 280
Tyr Glu Asn Pro Xaa Arg Xaa Gly Thr Val Ser Asn Asn Ile Ala
10 15 20

aac gca aat acc att ggg tat aag cag caa cag gta gtg ttt caa gac 328
Asn Ala Asn Thr Ile Gly Tyr Lys Gln Gln Gln Val Val Phe Gln Asp
25 30 35

ctg ttt agt caa gat tta gca ata ggt ttt act gga agt cag ggg cca 376
Leu Phe Ser Gln Asp Leu Ala Ile Gly Phe Thr Gly Ser Gln Gly Pro
40 45 50 55

aac cag gct ggt atg gga gca cag gtg gga agt gtt cgc aca att ttt 424
Asn Gln Ala Gly Met Gly Ala Gln Val Gly Ser Val Arg Thr Ile Phe
60 65 70

aca cag ggt gct ttt gaa cct ggc aat agt gta aca gat cct gct att 472
Thr Gln Gly Ala Phe Glu Pro Gly Asn Ser Val Thr Asp Pro Ala Ile
75 80 85

ggg gga aaa ggt ttt ttt cag gtt aca tta gag gat aaa gta cac tat 520
Gly Gly Lys Gly Phe Phe Gln Val Thr Leu Glu Asp Lys Val His Tyr
90 95 100

aca cga gca ggg aat ttt cgt ttt act caa gat ggt ttt tta aat gat 568
Thr Arg Ala Gly Asn Phe Arg Phe Thr Gln Asp Gly Phe Leu Asn Asp
105 110 115

c

569

<210> 7
 <211> 12
 <212> PRT
 <213> Lawsonia intracellularis

 <220>
 <221> VARIANT
 <222> (1)...(12)
 <223> Xaa = Any Amino Acid

 <400> 7
 Ser Leu Phe Ile Xaa Ala Asn Arg Tyr Glu Asn Pro
 1 5 10

<210> 8
 <211> 107
 <212> PRT
 <213> Lawsonia intracellularis

 <220>
 <221> VARIANT
 <222> (1)...(107)
 <223> Xaa = Any Amino Acid

<400> 8
 Xaa Arg Xaa Gly Thr Val Ser Asn Asn Ile Ala Asn Ala Asn Thr Ile
 1 5 10 15
 Gly Tyr Lys Gln Gln Gln Val Val Phe Gln Asp Leu Phe Ser Gln Asp
 20 25 30
 Leu Ala Ile Gly Phe Thr Gly Ser Gln Gly Pro Asn Gln Ala Gly Met
 35 40 45
 Gly Ala Gln Val Gly Ser Val Arg Thr Ile Phe Thr Gln Gly Ala Phe
 50 55 60
 Glu Pro Gly Asn Ser Val Thr Asp Pro Ala Ile Gly Gly Lys Gly Phe
 65 70 75 80
 Phe Gln Val Thr Leu Glu Asp Lys Val His Tyr Thr Arg Ala Gly Asn
 85 90 95
 Phe Arg Phe Thr Gln Asp Gly Phe Leu Asn Asp
 100 105

<210> 9
 <211> 1450
 <212> DNA
 <213> Lawsonia intracellularis

<220>
 <221> CDS
 <222> (3)...(410)

<221> CDS
 <222> (1080)...(1448)

<221> misc_feature
 <222> (1)...(1450)

<223> n = A,T,C or G

<400> 9

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ga tct aaa gag tct aca tat att gcc cga att gaa aat tct aca agt      47
  Ser Lys Glu Ser Thr Tyr Ile Ala Arg Ile Glu Asn Ser Thr Ser
    1             5             10             15

gaa aaa aca cta aat gat ctt gat ata ctt tta aaa gat gtg atg tta      95
Glu Lys Thr Leu Asn Asp Leu Asp Ile Leu Leu Lys Asp Val Met Leu
                20             25             30

aca tca aaa aag cat gaa tca cgt aga ctt gca gag tct gta cat caa      143
Thr Ser Lys Lys His Glu Ser Arg Arg Leu Ala Glu Ser Val His Gln
                35             40             45

aat att ctt acc cac ctt ata caa aaa aat tat aat act cac aat ggt      191
Asn Ile Leu Thr His Leu Ile Gln Lys Asn Tyr Asn Thr His Asn Gly
                50             55             60

ggg ata aaa tct gca cct ttt cat gtt ctt ata gga ccc aaa ata cca      239
Gly Ile Lys Ser Ala Pro Phe His Val Leu Ile Gly Pro Lys Ile Pro
                65             70             75

agt att ctt gtt gaa gta ggt tac tgt agt aat aaa gct gaa gca cag      287
Ser Ile Leu Val Glu Val Gly Tyr Cys Ser Asn Lys Ala Glu Ala Gln
                80             85             90             95

cgt ctg gca tct agt aat tac caa aaa gca tta ata gaa gga tta gct      335
Arg Leu Ala Ser Ser Asn Tyr Gln Lys Ala Leu Ile Glu Gly Leu Ala
                100             105             110

aaa ggt att ttc tgt tac cta aaa aaa cta cat cac ctt gat att tac      383
Lys Gly Ile Phe Cys Tyr Leu Lys Lys Leu His His Leu Asp Ile Tyr
                115             120             125

tct agt ttt aty cta tct aat tgc act taatagcttg gacaattatt          430
Ser Ser Phe Xaa Leu Ser Asn Cys Thr
                130             135

atatgaaggg tatccatgtg aaggtaacctg gttaagcttt taaatgtaaa aattatgcaa 490
ccatacytta ttccttcaga ggagcttcat tatgaaagta aaaactcttt ccatggctat 550
tttagcttgt ttattagtag ctaacagtgc attttcggct gacttcccta ttggtgtctt 610
taattctcaa tccattgcca tggagagtga agcagctaag gccgctcaaa aaaaattaca 670
atcagaattht ggtaatgaaa aaacacaact tgaaaacaag caaaagwttg cmaacaaaag 730
ctgatgattt acaagctwag tcagcagcta tgtytaacca agcacgtgaa gataaaciaa 790
gagaatttct tgaacttcgt cgtaatttcg aagaaaaaty tcgtgacttt gcaatacgtg 850
tcgaacaagc tgaaaacaca ttacgtcaat atntagctga acaaantnat nttgctgctg 910
aaactatagc aaaaaagaaa gggttaaact tgttttgata gtgttaggga agtgtaatgt 970
accttgaaaa aaatttagat attacaaaga aattyttgaa gccataaatg ctgcatggaa 1030
aaaaggtgga agtaaaacttc cagagatggc aaaccggaaa aaataacag atg ccc cag 1088
                                   Met Pro Gln

tat aaa ctt tca gaa att gct aaa ctt tta aac tta aca tta caa ggt      1136
Tyr Lys Leu Ser Glu Ile Ala Lys Leu Leu Asn Leu Thr Leu Gln Gly
140             145             150             155
```

gat gat att gaa gtt gta ggc gta aat aca ctt caa gat gca tca cca	1184
Asp Asp Ile Glu Val Val Gly Val Asn Thr Leu Gln Asp Ala Ser Pro	
160 165 170	
aat gag ata agt ttt cta gca aat gct aaa tat att cac cag ctt gtt	1232
Asn Glu Ile Ser Phe Leu Ala Asn Ala Lys Tyr Ile His Gln Leu Val	
175 180 185	
ttg tca cag gct ggt gct att att ctt tca aaa gaa tat gct agt cgt	1280
Leu Ser Gln Ala Gly Ala Ile Ile Leu Ser Lys Glu Tyr Ala Ser Arg	
190 195 200	
gtt cca cga gca cta atc agt act gaa cca tat aga gat ttt ggt aga	1328
Val Pro Arg Ala Leu Ile Ser Thr Glu Pro Tyr Arg Asp Phe Gly Arg	
205 210 215	
gtt ctt tct tta ttc tct ata cct caa gga tgt ttt gat ggt ata agt	1376
Val Leu Ser Leu Phe Ser Ile Pro Gln Gly Cys Phe Asp Gly Ile Ser	
220 225 230 235	
cat caa gct tat ata cac cct aca gca caa gtc tct aaa aca gct act	1424
His Gln Ala Tyr Ile His Pro Thr Ala Gln Val Ser Lys Thr Ala Thr	
240 245 250	
atc tat cct ttn gtt ttt ata gga tc	1450
Ile Tyr Pro Xaa Val Phe Ile Gly	
255	

<210> 10
 <211> 136
 <212> PRT
 <213> Lawsonia intracellularis

<220>
 <221> VARIANT
 <222> (1)...(136)
 <223> Xaa = Any Amino Acid

<400> 10	
Ser Lys Glu Ser Thr Tyr Ile Ala Arg Ile Glu Asn Ser Thr Ser Glu	
1 5 10 15	
Lys Thr Leu Asn Asp Leu Asp Ile Leu Lys Asp Val Met Leu Thr	
20 25 30	
Ser Lys Lys His Glu Ser Arg Arg Leu Ala Glu Ser Val His Gln Asn	
35 40 45	
Ile Leu Thr His Leu Ile Gln Lys Asn Tyr Asn Thr His Asn Gly Gly	
50 55 60	
Ile Lys Ser Ala Pro Phe His Val Leu Ile Gly Pro Lys Ile Pro Ser	
65 70 75 80	
Ile Leu Val Glu Val Gly Tyr Cys Ser Asn Lys Ala Glu Ala Gln Arg	
85 90 95	
Leu Ala Ser Ser Asn Tyr Gln Lys Ala Leu Ile Glu Gly Leu Ala Lys	
100 105 110	
Gly Ile Phe Cys Tyr Leu Lys Lys Leu His His Leu Asp Ile Tyr Ser	
115 120 125	
Ser Phe Xaa Leu Ser Asn Cys Thr	

130

135

<210> 11
 <211> 123
 <212> PRT
 <213> Lawsonia intracellularis

<220>
 <221> VARIANT
 <222> (1)...(123)
 <223> Xaa = Any Amino Acid

<400> 11
 Met Pro Gln Tyr Lys Leu Ser Glu Ile Ala Lys Leu Leu Asn Leu Thr
 1 5 10 15
 Leu Gln Gly Asp Asp Ile Glu Val Val Gly Val Asn Thr Leu Gln Asp
 20 25 30
 Ala Ser Pro Asn Glu Ile Ser Phe Leu Ala Asn Ala Lys Tyr Ile His
 35 40 45
 Gln Leu Val Leu Ser Gln Ala Gly Ala Ile Ile Leu Ser Lys Glu Tyr
 50 55 60
 Ala Ser Arg Val Pro Arg Ala Leu Ile Ser Thr Glu Pro Tyr Arg Asp
 65 70 75 80
 Phe Gly Arg Val Leu Ser Leu Phe Ser Ile Pro Gln Gly Cys Phe Asp
 85 90 95
 Gly Ile Ser His Gln Ala Tyr Ile His Pro Thr Ala Gln Val Ser Lys
 100 105 110
 Thr Ala Thr Ile Tyr Pro Xaa Val Phe Ile Gly
 115 120

<210> 12
 <211> 559
 <212> DNA
 <213> Lawsonia intracellularis

<220>
 <221> CDS
 <222> (3)...(296)

<221> CDS
 <222> (300)...(557)

<221> misc_feature
 <222> (1)...(559)
 <223> n = A,T,C or G

<400> 12
 ga tca aag ccg cat tta cng caa gag tta gaa att gaa gtt ttg aaa 47
 Ser Lys Pro His Leu Xaa Gln Glu Leu Glu Ile Glu Val Leu Lys
 1 5 10 15
 aaa gaa gac ttt ggg cgt cat att gtt aaa tta tgc tgg aaa ggt tct 95
 Lys Glu Asp Phe Gly Arg His Ile Val Lys Leu Cys Trp Lys Gly Ser
 20 25 30

tta tca aat atc ttt ttt tcc tat ggg gat atc ccg cac cca cct tat	143
Leu Ser Asn Ile Phe Phe Ser Tyr Gly Asp Ile Pro His Pro Pro Tyr	
35 40 45	
ata cat caa agt aat aag gtt cag gat aag gaa aga tat cnt acn gta	191
Ile His Gln Ser Asn Lys Val Gln Asp Lys Glu Arg Tyr Xaa Thr Val	
50 55 60	
tac tct ata tta cat aan ctg ggt tct gta gca gct cct aca gct gga	239
Tyr Ser Ile Leu His Xaa Leu Gly Ser Val Ala Ala Pro Thr Ala Gly	
65 70 75	
tta cnc ttt tct gaa act agc cgt nat aaa tta cac aaa nat ggt att	287
Leu Xaa Phe Ser Glu Thr Ser Arg Xaa Lys Leu His Lys Xaa Gly Ile	
80 85 90 95	
agt tgg gca taa atc cct ctt cac gtg gga tat gga aca ttc agt ccc	335
Ser Trp Ala Ile Pro Leu His Val Gly Tyr Gly Thr Phe Ser Pro	
100 105 110	
gtc ctc tgc aat gac atc cca aaa cat ctt atc cnt tct gag ttt gtt	383
Val Leu Cys Asn Asp Ile Pro Lys His Leu Ile Xaa Ser Glu Phe Val	
115 120 125	
cac ttt cct gaa act acn ttt tcc act ata tta aat gca cgg ttt gca	431
His Phe Pro Glu Thr Thr Phe Ser Thr Ile Leu Asn Ala Arg Phe Ala	
130 135 140	
ngg gaa tac cta tgt tct gcc ata ggg gac cca ctg ttg tcc cca cca	479
Xaa Glu Tyr Leu Cys Ser Ala Ile Gly Asp Pro Leu Leu Ser Pro Pro	
145 150 155	
ttg gan ggg tgt tat ctt acc cct ttc gcc cgg ggt tcc cct ccc caa	527
Leu Xaa Gly Cys Tyr Leu Thr Pro Phe Ala Arg Gly Ser Pro Pro Gln	
160 165 170	
ccc tat tcc att gng ttt tcc tct caa att at	559
Pro Tyr Ser Ile Xaa Phe Ser Ser Gln Ile	
175 180	

<210> 13

<211> 98

<212> PRT

<213> Lawsonia intracellularis

<220>

<221> VARIANT

<222> (1)...(98)

<223> Xaa = Any Amino Acid

<400> 13

Ser Lys Pro His Leu Xaa Gln Glu Leu Glu Ile Glu Val Leu Lys Lys	
1 5 10 15	
Glu Asp Phe Gly Arg His Ile Val Lys Leu Cys Trp Lys Gly Ser Leu	
20 25 30	
Ser Asn Ile Phe Phe Ser Tyr Gly Asp Ile Pro His Pro Pro Tyr Ile	

		35					40					45							
His	Gln	Ser	Asn	Lys	Val	Gln	Asp	Lys	Glu	Arg	Tyr	Xaa	Xaa	Val	Tyr				
	50					55					60								
Ser	Ile	Leu	His	Xaa	Leu	Gly	Ser	Val	Ala	Ala	Pro	Thr	Ala	Gly	Leu				
65					70				75						80				
Xaa	Phe	Ser	Glu	Thr	Ser	Arg	Xaa	Lys	Leu	His	Lys	Xaa	Gly	Ile	Ser				
				85					90					95					
Trp	Ala																		

<210> 14
 <211> 86
 <212> PRT
 <213> Lawsonia intracellularis

<220>
 <221> VARIANT
 <222> (1)...(86)
 <223> Xaa = Any Amino Acid

Ile	Pro	Leu	His	Val	Gly	Tyr	Gly	Thr	Phe	Ser	Pro	Val	Leu	Cys	Asn				
1				5					10					15					
Asp	Ile	Pro	Lys	His	Leu	Ile	Xaa	Ser	Glu	Phe	Val	His	Phe	Pro	Glu				
			20					25					30						
Thr	Xaa	Phe	Ser	Thr	Ile	Leu	Asn	Ala	Arg	Phe	Ala	Xaa	Glu	Tyr	Leu				
		35				40						45							
Lys	Ser	Ala	Ile	Gly	Asp	Pro	Leu	Leu	Ser	Pro	Pro	Leu	Xaa	Gly	Cys				
	50				55					60									
Tyr	Leu	Thr	Pro	Phe	Ala	Arg	Gly	Ser	Pro	Pro	Gln	Pro	Tyr	Ser	Ile				
65				70					75						80				
Xaa	Phe	Ser	Ser	Gln	Ile														
				85															

<210> 15
 <211> 477
 <212> DNA
 <213> Lawsonia intracellularis

<220>
 <221> CDS
 <222> (2)...(10)

<221> CDS
 <222> (14)...(178)

<221> CDS
 <222> (182)...(220)

<221> CDS
 <222> (224)...(256)

<221> CDS
 <222> (269)...(295)

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<221> misc_feature
<222> (1)...(477)
<223> n = A,T,C or G

<400> 15
t ata aaa cat tag cgn ctt tng tat ttg gac ttc aaa aaa att ttt aat 49
  Ile Lys His      Arg Leu Xaa Tyr Leu Asp Phe Lys Lys Ile Phe Asn
    1              5              10              15

tat ata gga gaa cat tca cca tta aaa cgt aat gta ant atg gaa gat   97
Tyr Ile Gly Glu His Ser Pro Leu Lys Arg Asn Val Xaa Met Glu Asp
      20              25              30

gta ggt aaa tct gct gtt ttt tta gct tca gac ctn tca tca gga gta 145
Val Gly Lys Ser Ala Val Phe Leu Ala Ser Asp Leu Ser Ser Gly Val
      35              40              45

acc ggt gaa ttn ttt ttg ttg atg ctg gna caa taa ttt agg tat tta 193
Thr Gly Glu Xaa Phe Leu Leu Met Leu Xaa Gln      Phe Arg Tyr Leu
      50              55              60

acc ata cat gct tta tac aac ata ttg tga gtt aca ata gcc ata aca 241
Thr Ile His Ala Leu Tyr Asn Ile Leu      Val Thr Ile Ala Ile Thr
      65              70              75

cat tta tat tct ata taataacagt ag aat aat aat aga ata ttt ttt atg 292
His Leu Tyr Ser Ile                      Asn Asn Asn Arg Ile Phe Phe Met
      80              85              90

acc atttgtatct atacaatagt aaatagatta atacatataa gactatatct 345
Thr

tttttgagag caacttaaag gagcggttat ggcttttagtt acaaaagaag aagtacttca 405
ataccatagt gaaccccgac caggtaaact tgaagtatct tctataaaac catgtaaaac 465
acaaaaagat cc                                     477

<210> 16
<211> 3
<212> PRT
<213> Lawsonia intracellularis

<400> 16
Ile Lys His
1

<210> 17
<211> 55
<212> PRT
<213> Lawsonia intracellularis

<220>
<221> VARIANT
<222> (1)...(55)
<223> Xaa = Any Amino Acid

```

<400> 17
Xaa Leu Xaa Tyr Leu Asp Phe Lys Lys Ile Phe Asn Tyr Ile Gly Glu
1 5 10 15
His Ser Pro Leu Lys Arg Asn Val Xaa Met Glu Asp Val Gly Lys Ser
20 25 30
Ala Val Phe Leu Ala Ser Asp Xaa Ser Ser Gly Val Thr Gly Glu Xaa
35 40 45
Phe Leu Leu Met Leu Xaa Gln
50 55

<210> 18
<211> 13
<212> PRT
<213> Lawsonia intracellularis

<400> 18
Phe Arg Tyr Leu Thr Ile His Ala Leu Tyr Asn Ile Leu
1 5 10

<210> 19
<211> 11
<212> PRT
<213> Lawsonia intracellularis

<400> 19
Val Thr Ile Ala Ile Thr His Leu Tyr Ser Ile
1 5 10

<210> 20
<211> 9
<212> PRT
<213> Lawsonia intracellularis

<400> 20
Asn Asn Asn Arg Ile Phe Phe Met Thr
1 5

<210> 21
<211> 525
<212> DNA
<213> Lawsonia intracellularis

<220>
<221> CDS
<222> (2)...(352)

<221> CDS
<222> (356)...(361)

<221> CDS
<222> (365)...(409)

<221> CDS

<222> (413)...(433)

<221> CDS

<222> (437)...(451)

<221> CDS

<222> (455)...(523)

<400> 21

g gaa ttg tta gta ttc tcc cag aac aga agc caa aat att tgg cta ctt 49
Glu Leu Leu Val Phe Ser Gln Asn Arg Ser Gln Asn Ile Trp Leu Leu
1 5 10 15

aca tta cct att ttt gtg tta ggt ata gca caa ggt ata tca ttt cct 97
Thr Leu Pro Ile Phe Val Leu Gly Ile Ala Gln Gly Ile Ser Phe Pro
20 25 30

tta gta aac agc cac att aca tca ctt gca cca aca tcc aac aga gct 145
Leu Val Asn Ser His Ile Thr Ser Leu Ala Pro Thr Ser Asn Arg Ala
35 40 45

att gtt atg gct ata aac agt aca ttt atg agg tta agt cag agt att 193
Ile Val Met Ala Ile Asn Ser Thr Phe Met Arg Leu Ser Gln Ser Ile
50 55 60

tcg caa atg gtt ttt ggt att gga tgg tca ttt ttt ggt tgg cct ggt 241
Ser Gln Met Val Phe Gly Ile Gly Trp Ser Phe Phe Gly Trp Pro Gly
65 70 75 80

cct ttt ata ttt ggt ctt ttt act tct att ata tta gcc ctc tta att 289
Pro Phe Ile Phe Gly Leu Phe Thr Ser Ile Ile Leu Ala Leu Leu Ile
85 90 95

atg aag tat ttt caa gat gta acc caa tat cac cta ttt ttg ata agt 337
Met Lys Tyr Phe Gln Asp Val Thr Gln Tyr His Leu Phe Leu Ile Ser
100 105 110

agt aaa ttt tat tat taa aaa gct tag tta gtt aag att aca tat att 385
Ser Lys Phe Tyr Tyr Lys Ala Leu Val Lys Ile Thr Tyr Ile
115 120 125

ata tac aat tac tat aac att aac taa tta cta act att act tcc aat 433
Ile Tyr Asn Tyr Tyr Asn Ile Asn Leu Leu Thr Ile Thr Ser Asn
130 135 140

tga tta att gat gct att taa aga gga tat att aat gat gtc atg gct 481
Leu Ile Asp Ala Ile Arg Gly Tyr Ile Asn Asp Val Met Ala
145 150 155

cac aat agg tgt tat cct tgg att agt gca tgg gat cca ggt 523
His Asn Arg Cys Tyr Pro Trp Ile Ser Ala Trp Asp Pro Gly
160 165

cc 525

<210> 22

<211> 117

<212> PRT
<213> Lawsonia intracellularis

<400> 22
Glu Leu Leu Val Phe Ser Gln Asn Arg Ser Gln Asn Ile Trp Leu Leu
1 5 10 15
Thr Leu Pro Ile Phe Val Leu Gly Ile Ala Gln Gly Ile Ser Phe Pro
20 25 30
Leu Val Asn Ser His Ile Thr Ser Leu Ala Pro Thr Ser Asn Arg Ala
35 40 45
Ile Val Met Ala Ile Asn Ser Thr Phe Met Arg Leu Ser Gln Ser Ile
50 55 60
Ser Gln Met Val Phe Gly Ile Gly Trp Ser Phe Phe Gly Trp Pro Gly
65 70 75 80
Pro Phe Ile Phe Gly Leu Phe Thr Ser Ile Ile Leu Ala Leu Leu Ile
85 90 95
Met Lys Tyr Phe Gln Asp Val Thr Gln Tyr His Leu Phe Leu Ile Ser
100 105 110
Ser Lys Phe Tyr Tyr
115

<210> 23
<211> 2
<212> PRT
<213> Lawsonia intracellularis

<400> 23
Lys Ala
1

<210> 24
<211> 15
<212> PRT
<213> Lawsonia intracellularis

<400> 24
Leu Val Lys Ile Thr Tyr Ile Ile Tyr Asn Tyr Tyr Asn Ile Asn
1 5 10 15

<210> 25
<211> 7
<212> PRT
<213> Lawsonia intracellularis

<400> 25
Leu Leu Thr Ile Thr Ser Asn
1 5

<210> 26
<211> 5
<212> PRT
<213> Lawsonia intracellularis

<400> 26

Leu Ile Asp Ala Ile
1 5

<210> 27

<211> 23

<212> PRT

<213> Lawsonia intracellularis

<400> 27

Arg Gly Tyr Ile Asn Asp Val Met Ala His Asn Arg Cys Tyr Pro Trp
1 5 10 15
Ile Ser Ala Trp Asp Pro Gly
20

<210> 28

<211> 846

<212> DNA

<213> Lawsonia intracellularis

<220>

<221> misc_feature

<222> (1)...(846)

<223> n = A,T,C or G

<400> 28

tattttactcg cgcggccggg cgtcttacac aaatggatcc cttgcantaa tccaaggata 60
acnccatttg tganccatga acatcatcan natatcctct ttanatangca tcnannntc 120
aannggaatt aacagttact anntagttaa tgatcatagta attgtcnata atatatgtaa 180
tcttaactaa ctaagctnnt taataataaa attnactact tatcaanaat aggtgatatn 240
gggttacatc ttgaaaatac ttnccataat tangagggct aatataatng aantaataag 300
accanataata aaaggaccag gccaaccaaa aaatgaccat ccaataacna aaacaattgg 360
cgaaaataact ctgacttaac ctcanaaatg tactgtttat agccatatca atagctctgt 420
tggatgtngg ngcaattgat gtaatgtggc tgtntactan angaaatgat ntacctcgtg 480
ctatnccan nacaanaata ngtaatgtaa gtanccnaat atcttggctt tgtaatggga 540
gaataatnnc aagtccttgg gaaatnaant tacnccagc cagctatnnt aagcagttct 600
ntggtgacta tacgtcctac tnaantcgtg ccaaagatta aatanncgat aatcgcnctn 660
cctaaancan gcaataactaa aatggtttct ncctancttg gnatanggtg gaagcncgga 720
cagaattnan ttgcgnantt tanannggaa natnccgtnaa nttantcggg gccannccn 780
aaattcctna ntcnatanan naactnnctn ctntaaaang gccnactgga ntngttaaat 840
gaaata 846

<210> 29

<211> 855

<212> DNA

<213> Lawsonia intracellularis

<220>

<221> misc_feature

<222> (1)...(855)

<223> n = A,T,C or G

<400> 29

gattntttat cgatcactnt agacgggatt tgggnaacac ttacctggta nccacccggg 60
tggaaaaatc gatggggccc cggccgctct agaagtactc tcgagaagct ttttgaattc 120

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tttggatcct caacacaggg tatggattaa aacaacttta gctctaacag gagcatttta 180
taatatattc cctggtagaa caatatctac tcaagaaaat ctgtctattg gttttcaact 240
aaaaaaaaact tttaaacctt ttcattggac catcttactc ttagatgaac attatatgtc 300
ttcgccaaga attgcagcag caattatgcc tgcacagctt gctggagtta aaaacattat 360
agctgttttg accagtaaaa ataaccgact gaccgctgaa aaaatctcac ctgctttact 420
aacaacatta gaactttcag gagttaacat agccctaaca cttaccaca ctgaaactga 480
acttcttatt catcaattaa tgaaaatagg tattggaaac ctgttatatt ttttaaaga 540
agaagacata ctacatatat ctactatacc tgtactacct ttctggaaag aatatacttc 600
tcatcgactt gttatagaaa aagatgctgg cnttaataca gaaatcctcc aatgggcnca 660
tcctcattca attattgaac aaatagcaac agaaccatac tctgaaanat atcccagatg 720
cactttactg tgctagctca tccantaaaa actatnctca tanagnatcc ccagaatttt 780
tcatnatgga cttgaaccta tttggattca ncccaacnct tcctccaanc ctccctttctc 840
catacaccat gggga 855

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<210> 30
<211> 1082
<212> DNA
<213> Lawsonia intracellularis

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<220>
<221> misc_feature
<222> (1)...(1082)
<223> n = A,T,C or G

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<400> 30
tatctngttg antcaataaa acttttgggg cccntnaaan tttcatnann aaaaaaacia 60
nattnctggg ggncccntcc caaaaaannc aatcantnng aancttgnct tcttattnng 120
nttttnanac tataatatnt nttatcnata atnnatcnnt atactnattt ctnattcant 180
nacannngnn agnaanntta atctnaaana ctncnaaggg ggnnntnata ntntttnttt 240
ntttntcccn ttnaatnnat aacnnncac ccnnattant ttnaatnnat accatancnn 300
cctttcaaac tgtacacata ntannnaann acactcnanc nttttncatc ctctctantn 360
ccnactccna tnnanctntt ccccatncc tatntntcnc tgcttcccag nttnnacntn 420
ncttnntttc acantattcc tatccaanct aacatntntn ntntcntnct ccttntntnt 480
tatntntttc tnntacctnn cactgacant ctatnantna nntcnnatac tnntatanct 540
ntangcnant ntatctanaa ntntancnnn nnatcntnac ngccgttnnat ntntnnnncan 600
ttanntannn ctancntnnc caannncnta tntatnaata acnactatcc natattnnat 660
tnnnntntnt cntanncaaa tnatttngc ncacnnccact angtnatatn annattntat 720
attntgaanc ttctnggctt cncnaatant accantnnnc anctcnnnt ncatctnnnt 780
ntacttenta ccatanegct ctenagnntc actacttcta ntagtnatcn tctactgccc 840
atggcnnnnn gcnnnncgan agntatncac ntacantnnc ntctactatn tanatctann 900
ncttccgngg cctncngtac gnntnggcna antcgnntac tttncntnta tctagtcnca 960
tcagnnnntg antcctcaan cngctctan ttacatgtnn nntnatgcnc tanancgnna 1020
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cc 1082

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```

<210> 31
<211> 354
<212> DNA
<213> Lawsonia intracellularis

```

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<220>
<221> misc_feature
<222> (1)...(354)
<223> n = A,T,C or G

```

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<400> 31
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ttttaaaaga tgtgatgtta acatcaaaaa agcatgaatc acgtttagact tgcagagtct 120
gtacatcaaaa atattcttta cccaccttaa tacgaaaana aatnnttatn cncncnatg 180
ggtggggntn aaatcctngc cccnttnccc tgttcnttta gggaaccccc naattcccn 240
ngttattcct ctgtttgaaa nttctggttn cccggccctn tnaccaanag cttgannncc 300
nccccgtcct ggggcatacct cntgtttatt ttccctonan ccccccttn actn 354

```

```

<210> 32
<211> 477
<212> DNA
<213> Lawsonia intracellularis

```

```

<220>
<221> misc_feature
<222> (1)...(477)
<223> n = A,T,C or G

```

```

<400> 32
ggatcttttt gtgtttttaca tggttttata ggaaataactt caagtttacc tggtcgggggt 60
tcaactatggt attgaagtac ttcttctttt gtnactaaag ccataaccgc tcctttaagt 120
tgttctcaaaa aagaatatag tcttatatgt attaatctat ttactattgt atagatacaa 180
taggtcataa aaaatattct attattattc tactgttatt atatagaata taaatgtgtt 240
atggctattg taactcacia tatgttgtat aaagcatgta tggttaaata cctaaattat 300
tgtncagca tcaacaaaaa naattcacog gttactcctg atganaggtc tgaagctaaa 360
aaaacagcag atttacctac atcttcata nttacattac gttttaatgg tgaatgttct 420
cctatataat taaaaatttt tttgaagtcc aaatacnaaa gncgctaata ttttata 477

```

```

<210> 33
<211> 568
<212> DNA
<213> Lawsonia intracellularis

```

```

<220>
<221> misc_feature
<222> (1)...(568)
<223> n = A,T,C or G

```

```

<400> 33
gatcatttaa aaaaccatct tgagtaaaac gaaaattccc tgctcgtgta tagtgtactt 60
tatcctctaa tgtaacctga aaaaaacctt ttccaccaat agcaagatct gttacactat 120
tgccagggttc aaaagcacc tgtgtaaaaa ttgtgcgaac acttccaacc tgtgctccca 180
taccagcctg gtttggtccc tgacttccag taaaacctat tgctaaatct tgactaaaca 240
ggtcttgaaa cactacctgt tgctgcttat acccaatggg atttgcgta gcaatattat 300
tgagagacagt accanccctg tncatgggt ttccatacct gttggcanca ataaacaaac 360
tccccatcat gataacatct cctaaaaaat aatttcattg nggnaaaaat gttacctaca 420
catctctatt ttnaagcaa aaaacccatg cccaanaaaa tttttgggcc naattaatat 480
acttaatcta ataaactttt ttgggtaatn aaaaaaatt aattttttta acttggtttn 540
accaaccttt tctccttact ttttaacc 568

```

```

<210> 34
<211> 477
<212> DNA
<213> Lawsonia intracellularis

```

```

<220>
<221> misc_feature
<222> (1)...(477)
<223> n = A,T,C or G

```

<400> 34

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ggtacccac cgggtggaa aatcgatggg cccgcggcgg ctctaaaant actctcgaga 60
agctttttga attcttttga tccccaggaa taacttggtg acggaatttt acattttcta 120
tccctgcaaa tanaaaaact ttaccttgta gttcattaat aggaaaagat tggagtactg 180
tgattccacc tgattgcgcc atagcttcta aaattagaac tccaggcatg acaggaaatc 240
caggggaaat gaccngaaa aaatggttca ttaatactaa cattttttata agctttaata 300
tatttgccag cattaaattc aataactcta tctacaatta aaaaggata acggtgggga 360
atttactgta aaattttctg gatattttgg aggtatggat ggggacatta attttcctat 420
atatatgctc tttttctttt cnaaaatttt tcagcttttt tatcccntaa aaacctc 477
```